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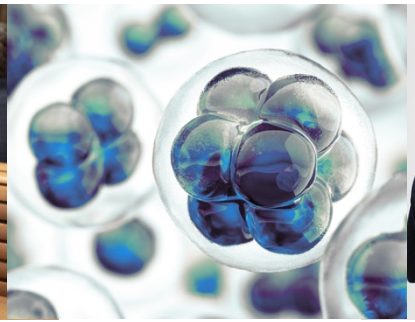
The EPO and Industry 4.0

Patent Protection for 4th Industrial Revolution Technologies


Luc De Vos
Director, ICT
October 2019

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- IP and Industry 4.0
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- Patents for Business Methods
- Patents for Block-chain Inventions
- Patents for Artificial Intelligence / Machine Learning
- EPO Guidelines for Examination: Index for CII
- Conclusion

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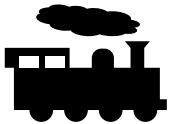
Industry 4.0 in the industrial landscape



1st industrial revolution

steam energy, coal, transport
geography: UK
investments: railways

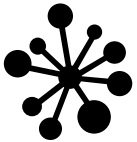
3rd industrial revolution

electronics and IT, flight, nuclear energy
geography: USA
investments: universities, technological centres of excellence (e.g. Silicon Valley), the internet infrastructure

1784 | 1870 | 1960s | Today »

2nd industrial revolution

electricity, oil, mass production
geography: Germany and Continental Europe
investments: electricity and road infrastructures



4th industrial revolution

connectivity, software, artificial/distributed intelligence, the industrialisation of every process, renewable energy
geography: will be in the Far East?
investments: cloud/digital infrastructure: large capacity data centres, high speed data transfer

From Industry 3.0 to Industry 4.0

Industry 3.0

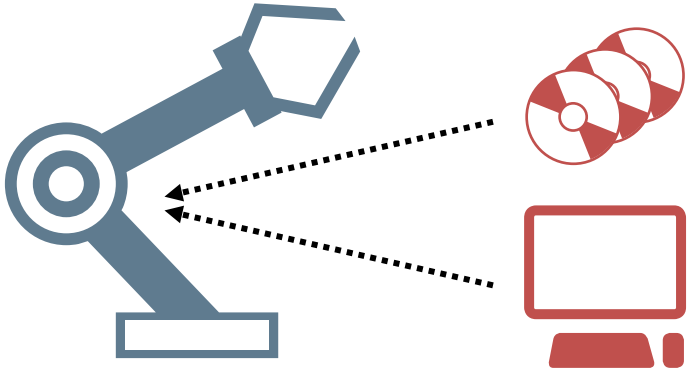
A computer in every home.

Industry 4.0

A computer in every object.
And connected.

One person, 100s of CPUs
(on wearables, medicine dispensers, watch, sports equipment etc.).

Industry 4.0: it's all about software

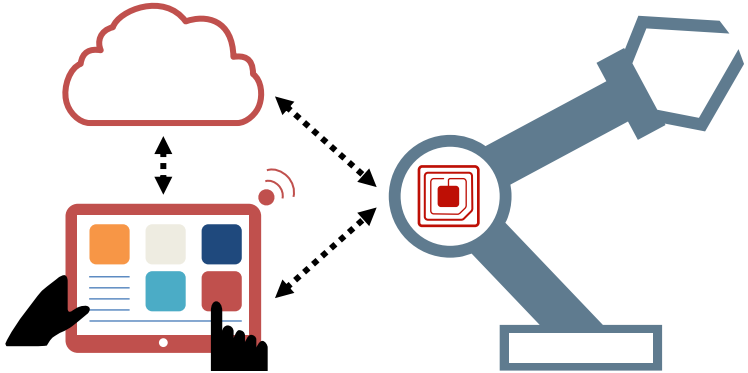


Today

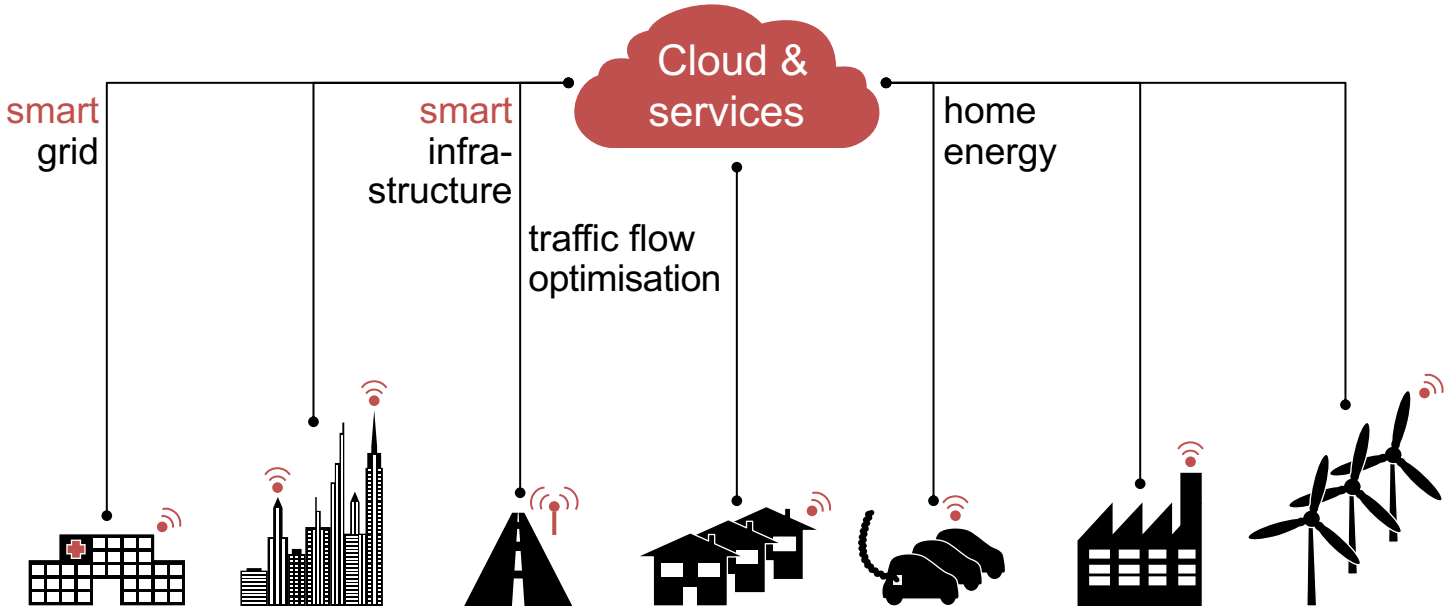
Advanced machines using standard software
(advances from improving the machine)

Industry 4.0

Advanced software using standard machines
(advances from improving the software)

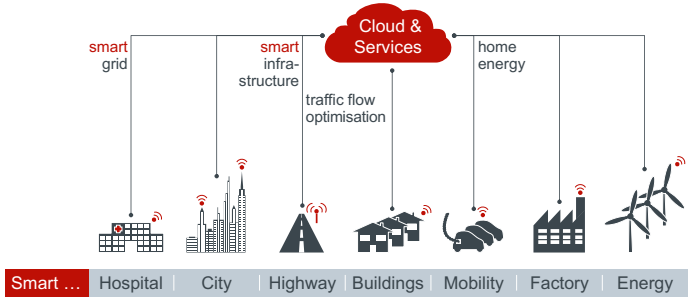


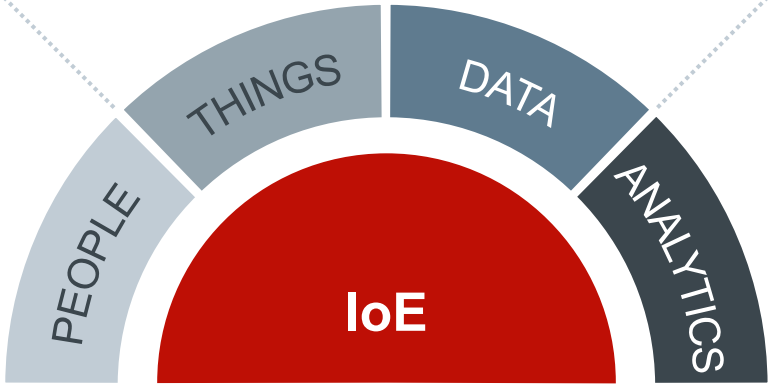
The Internet of Things (IoT)



Smart …	Hospital	City	Highway	Buildings	Mobility	Factory	Energy

Internet of Everything (IoE)





Implications for IP (1)

Industrial revolution → IP revolution

The IP / licensing system today is still adapting to Industry 3.0

- Patents and standards, open Source, software, copyright ...
- Fast development cycles (weeks to months) vs long granting cycles (months to years). No need for 20 years protection?

The meaning of fundamental concepts will be challenged:

- Concepts such as “industrial”, “technical“, “ aesthetic“, “abstract”, “mental act” will become even more crucial to understand within the patenting process.
- Who/what is an “inventor” (99% machine invention)?

Implications for IP (2)

Further steps to adapt to Industry 4.0 – major IP issues:

- **Networked / territorial aspects**. Where is the innovation produced or put into practice? Need for more regional, global protection.
- Inventions increasingly in **virtualised** level – disconnected from the physical object
- Clarity on patenting of **inventions using software** (Computer Implemented Inventions - CII)

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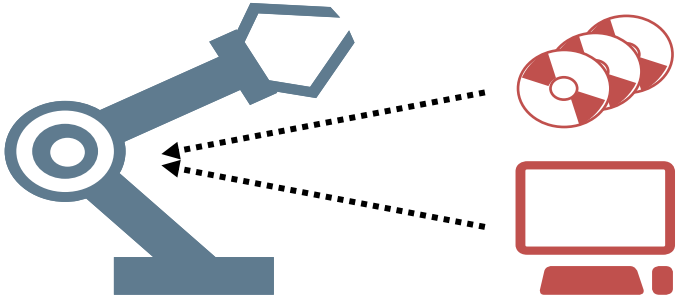
Industry 4.0: it's all about software



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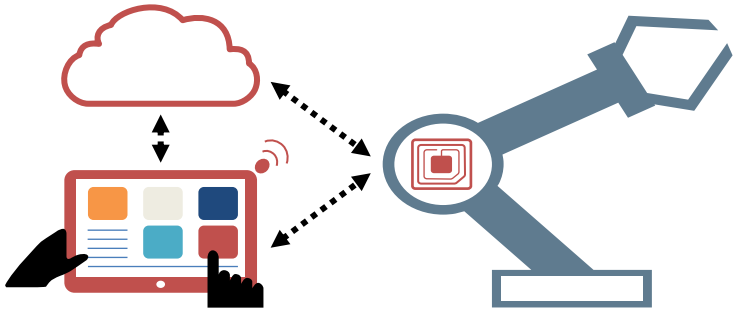

At the EPO Industry 4.0 innovation means dealing with CII's

Definition of “Computer Implemented Invention (CII)

- Not merely a claim about software, but rather:
- The implementation of an invention using
  - a computer;
  - a network of computers;
  - a programmable logic device.
- The features of the invention are realized wholly or partially by means of a computer program:

A program controlled...
- washing machine cycle
- car braking system
- navigation system

Patenting Computer-Implemented Inventions

- Are computer-implemented inventions patented by the EPO?

Yes!

- ...if they meet the requirements of the EPC.

„The invention must describe
a **technical** solution
to a **technical** problem.“

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Technical character of a computer program

- A computer program has a technical character if it produces a "further technical effect" when run on a computer (G 3/08):

  A technical effect going beyond the normal physical interactions between the program (software) and the computer (hardware) on which it is run

Circulation of electrical currents in the computer is not sufficient

Examples of further technical effects (G-II, 3.6.1)

Technical method	Control of the computer	Specific technical considerations
If the computer program specifies a method which itself produces a technical effect, e.g. ▪ Controlling the anti-lock braking system ▪ Determining emissions by an X-ray device ▪ Compressing video	**If the computer program controls the operation or functioning of the computer, e.g.** ▪ Processor load balancing ▪ Memory management ▪ Compilers or builders for processing code at low level	**If the design of the program is based on specific technical considerations of the internal functioning of the computer, e.g.** ▪ Algorithms adapted to the underlying architecture ▪ Security algorithms based on understanding of the internal functions

The computer program produces a further technical effect

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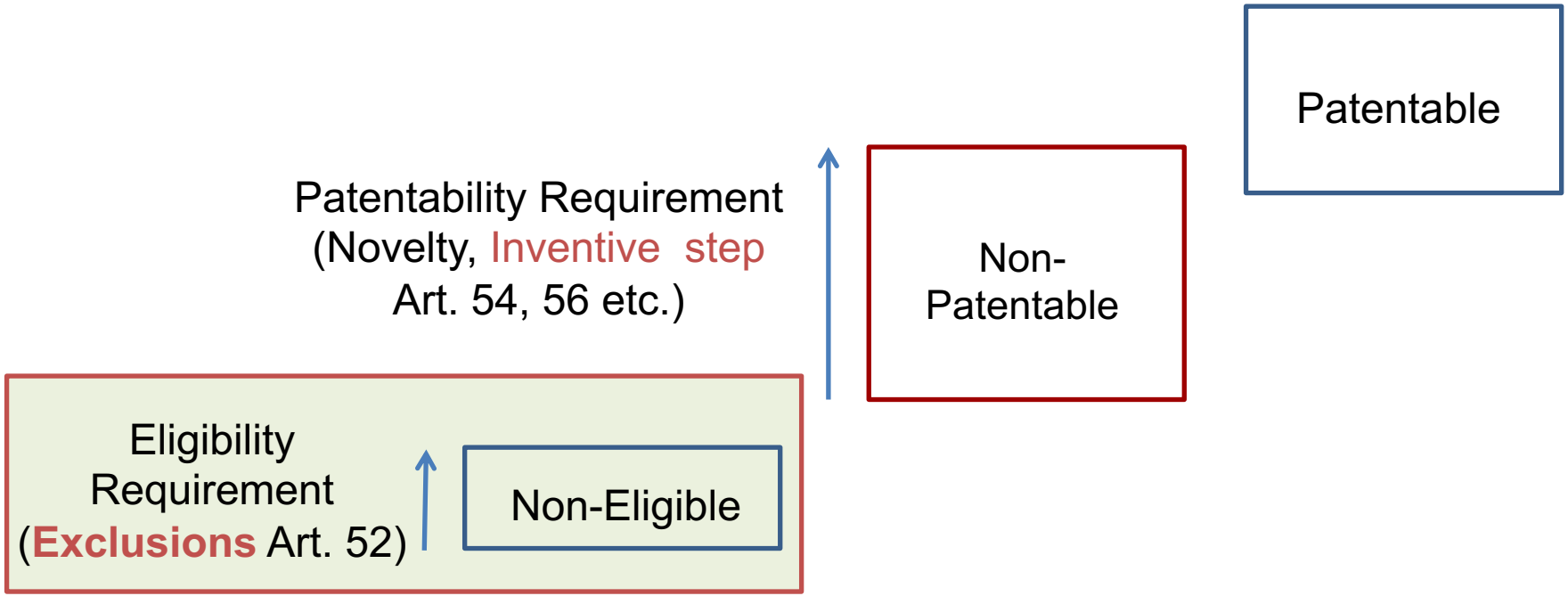
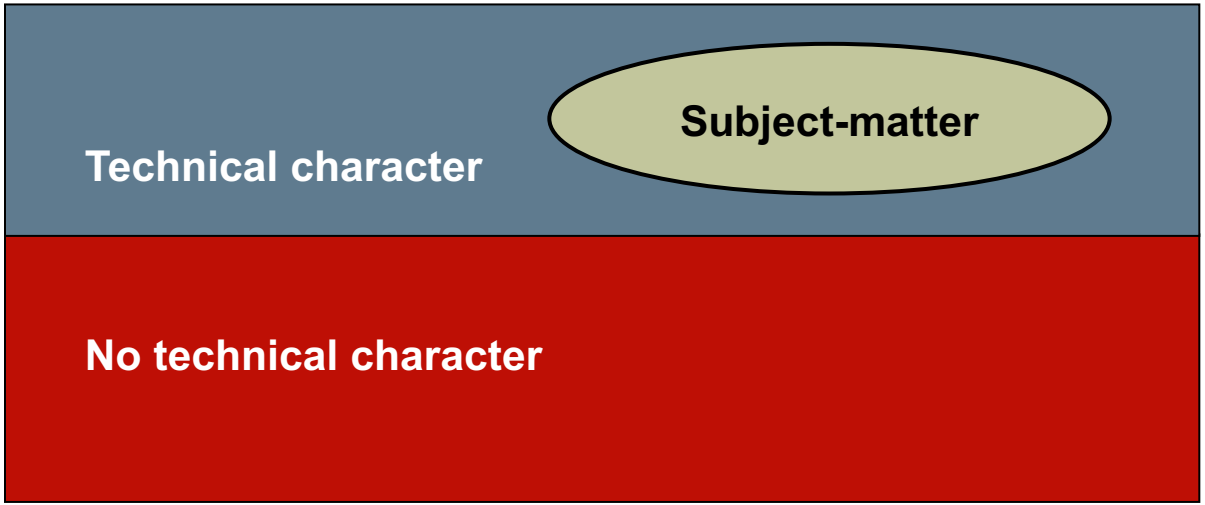
EPO Practice – First Legal Requirement.



EPO Practice: First Legal Requirement (Eligibility)

✓ **Subject-matter *is not* excluded from patentability**

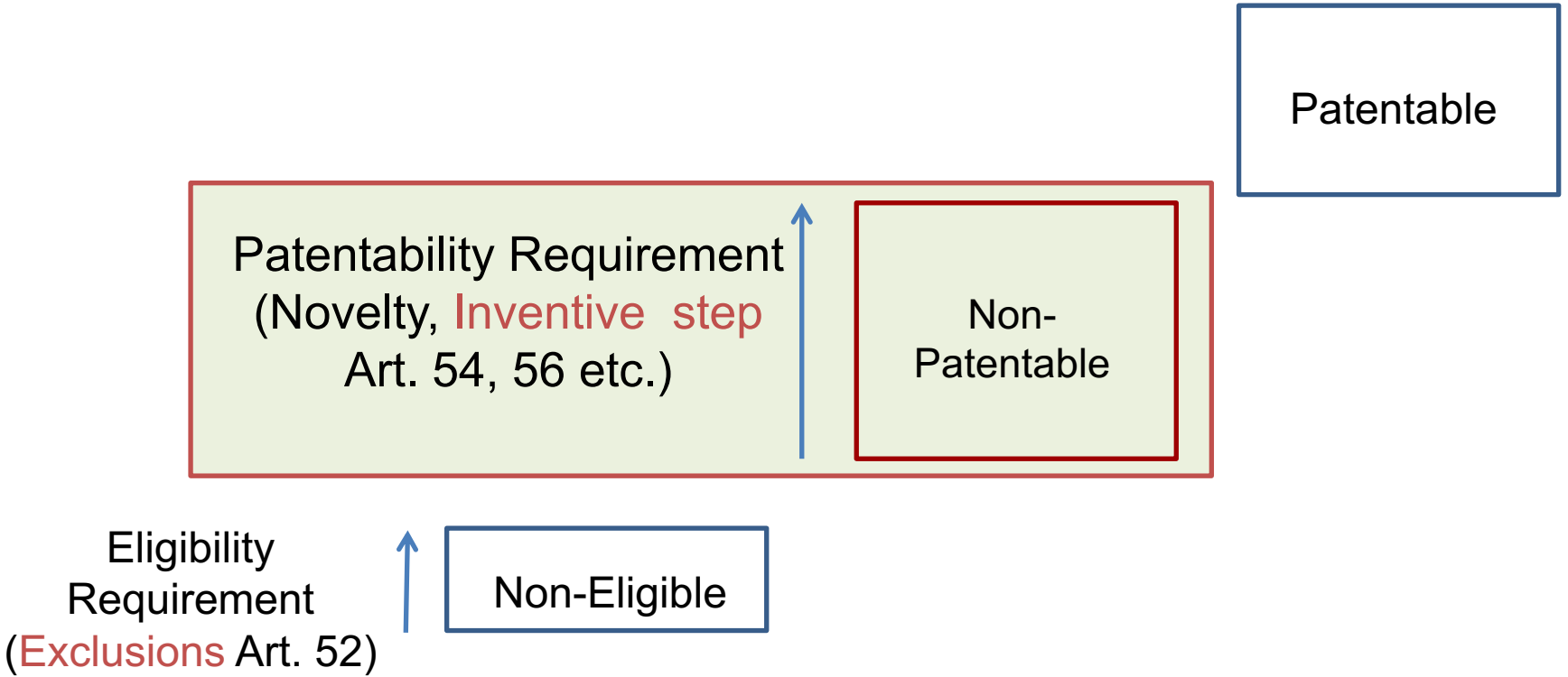
× **Subject-matter *is* excluded from patentability**



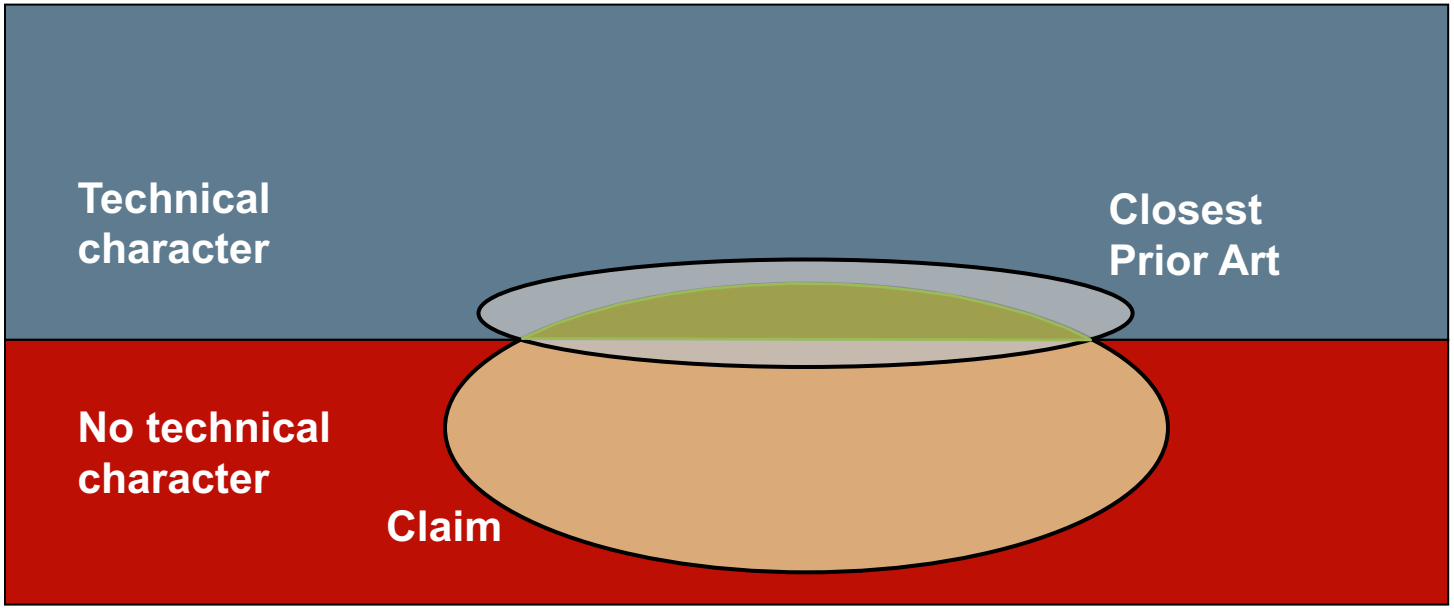
When at least one feature has technical character =>

subject-matter is patent eligible

EPO Practice – Second Legal Requirement

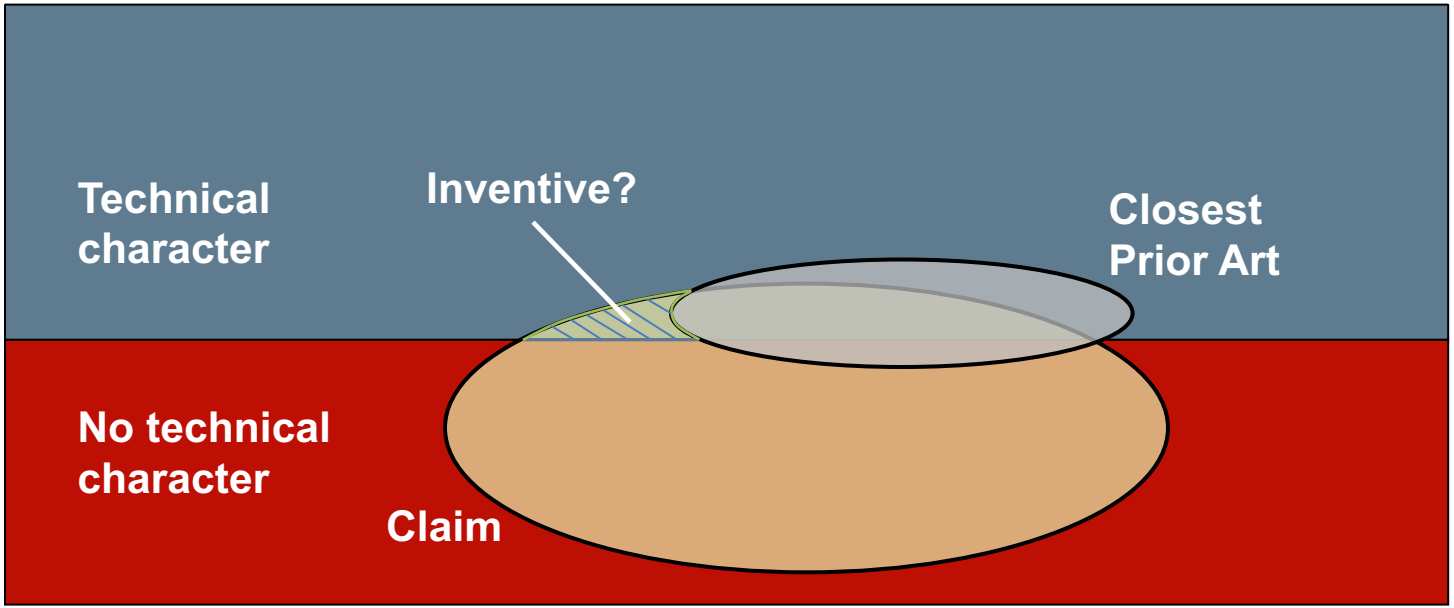


EPO Practice: Second Legal Requirement (Patentability)



Technical features are known from the prior art => lack of inventive step

EPO Practice: Second Legal Requirement (Patentability)



A non-obvious solution to a technical problem is required

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Business Methods: Examination of Inventive Step

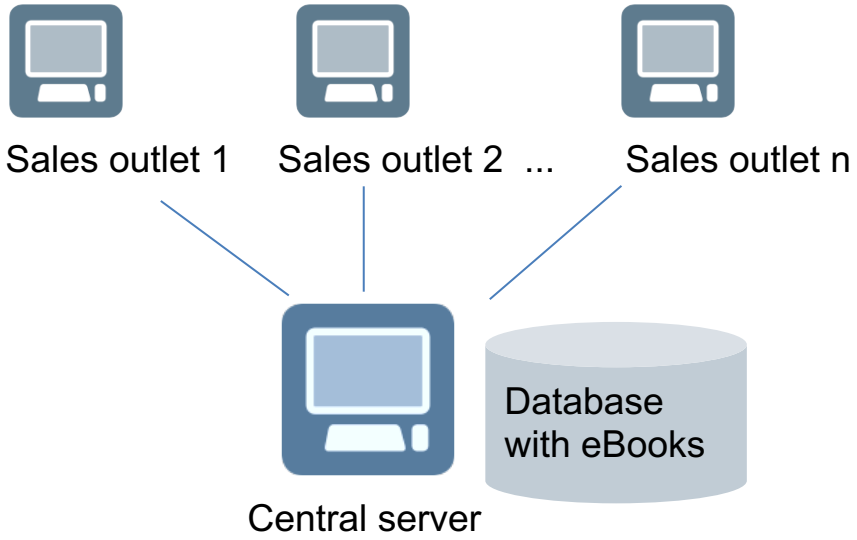
- In most business method cases, the features that contribute to the technical character of the invention are limited to those specifying a particular technical implementation.

- Features which specify a particular technical implementation are **not** features of the business method and have to be taken into account in the assessment of inventive step.

Example (1/2)

- Example of implementation choices
- Lies within the competence of a technically skilled person
- Features specifying any of these two possible technical implementations contribute to the technical character of the invention

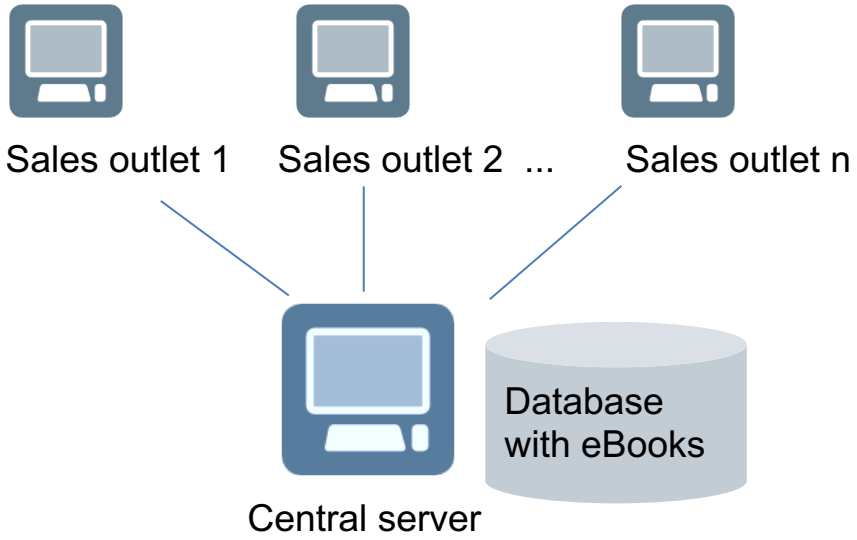
☑ technical, and have to be taken into account in the assessment of inventive step



Distribution of eBooks can be done in two ways:

- by downloading the eBooks from the central server/database directly into the terminals real-time, or
- by downloading in advance the eBooks to the local terminal of the sales outlet

Example (2/2)



- Example of a requirement which is a business method
- Lies within the competence of the business person
- Features related to the business method do not contribute to the technical character of the invention

non-technical, and
cannot support the presence of an inventive step

A requirement that the eBooks offered to the customers are different for each sales outlet

Assessment of technical effects

The following do **not** qualify as technical effects:

- Circumventing a technical problem (T 258/03)

  Example: changing the rules of an electronic auction to obviate the need for timestamp information in the bid messages

  → amounts to circumventing the problem rather than solving it with technical means

- Effects inherent to the business method

  Example: an automated accounting method that avoids redundant bookkeeping may require less computing resources (T 477/08)

  → If this effect results from the business specification of the accounting method, then it does not qualify as a technical effect

Assessment of technical effects

Not sufficient for business method to contribute to the technical character of an invention:

- The mere possibility of serving a technical purpose

  Example: “method of resource allocation in an industrial process” can relate to any industrial process and not necessarily a technical process (T 306/04)

- The mere fact that the input to a business method is real-world data, even if the data relates to physical parameters (T 154/04)
- That the result of a business method is useful, practical or saleable (T 388/04, T 619/02)

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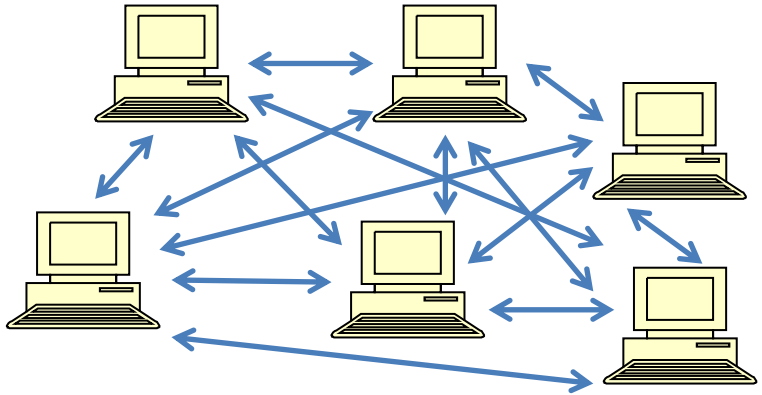
What is a Blockchain?

- **Blockchain** = Chain of Blocks.
- **Block**
  - a “ledger” page (like a page in a register book).
  - a data structure, or a file.
- **Content of a block** = items to be secured in a tamper-proof way
  - (usually financial) transactions (-> bitcoin payments)
  - legal documents, marriage licences
  - diamond certification and transaction history
  - disclosure of prior art with timestamp
  - data for proving authenticity (e.g. in fashion industry)

How to “secure in a tamper-proof way”?

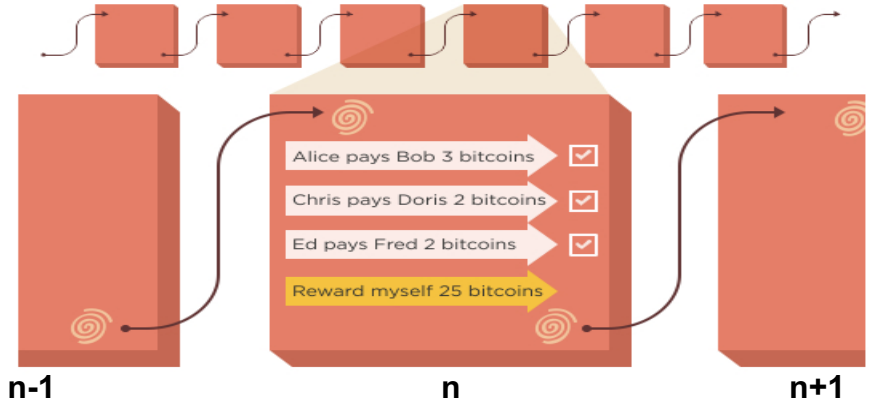
- Replicating the data over many systems in realtime
- Usually in a peer-to-peer network (not dependent on server).



- Verification by consensus of majority in the network
- Use of cryptography makes changes of historical records impossible.

Principle: cryptographic hash

- calculate fingerprint n of block n (unique to the block's contents)
- Store fingerprint n as part of the next block n+1
- calculate (unique) fingerprint of block n+1; etc.
- Changing block n would change its fingerprint n, hence also block n+1, etc. This cannot happen in the network! Stored data are safe.



Blockchain inventions = Computer Implemented Inventions

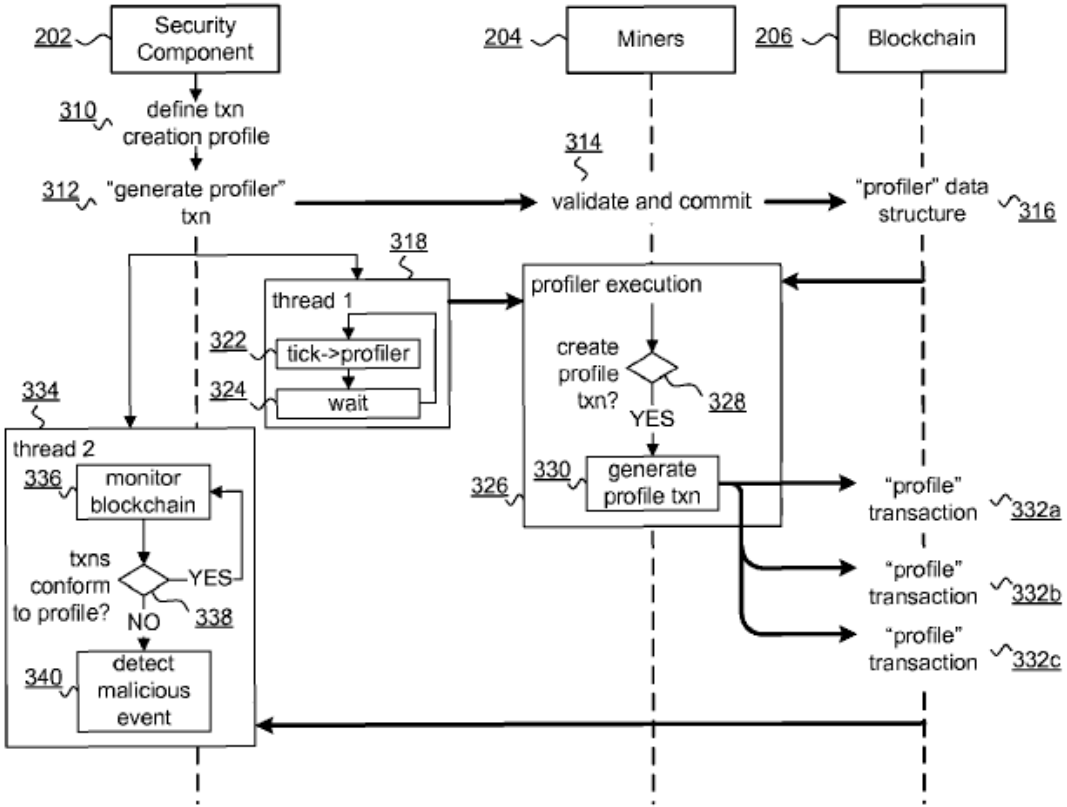
Business methods	Payments, transactions, supply chain management, business models in energy	G-II, 3.5.3
Networking	P2P, cloud, client-server, routing, broadcast	F-IV, 3.9.3
Security	Cryptography, prevent tampering	G-II, 3.3 and 3.6
Mathematics	Hashing, Crypto puzzle	G-II, 3.3
Databases	Data structures, synchronisation	G-II, 3.6.3
Computers	Racks and grids, speed and power issues	G-II, 3.6
Medical apps	Record keeping	G-II, 4.2
AI	Training, federated learning	G-II, 3.3.1
Program	S/w implementation, micro-contracts	G-II, 3.6
Xxxx	Xxxx	CII Guidelines

Key question:
Is there a technical solution to a technical problem?

- booking a service by payment 
- documenting the time of payment 

- increasing security in sharing an encryption/decryption key 
- how to better secure transactions 
- how to secure a transaction in realtime 
- how to detect malicious events in a blockchain 

Example 1: Modifying and improving the Blockchain - ICT



Example 2: Use of Blockchain - M&M

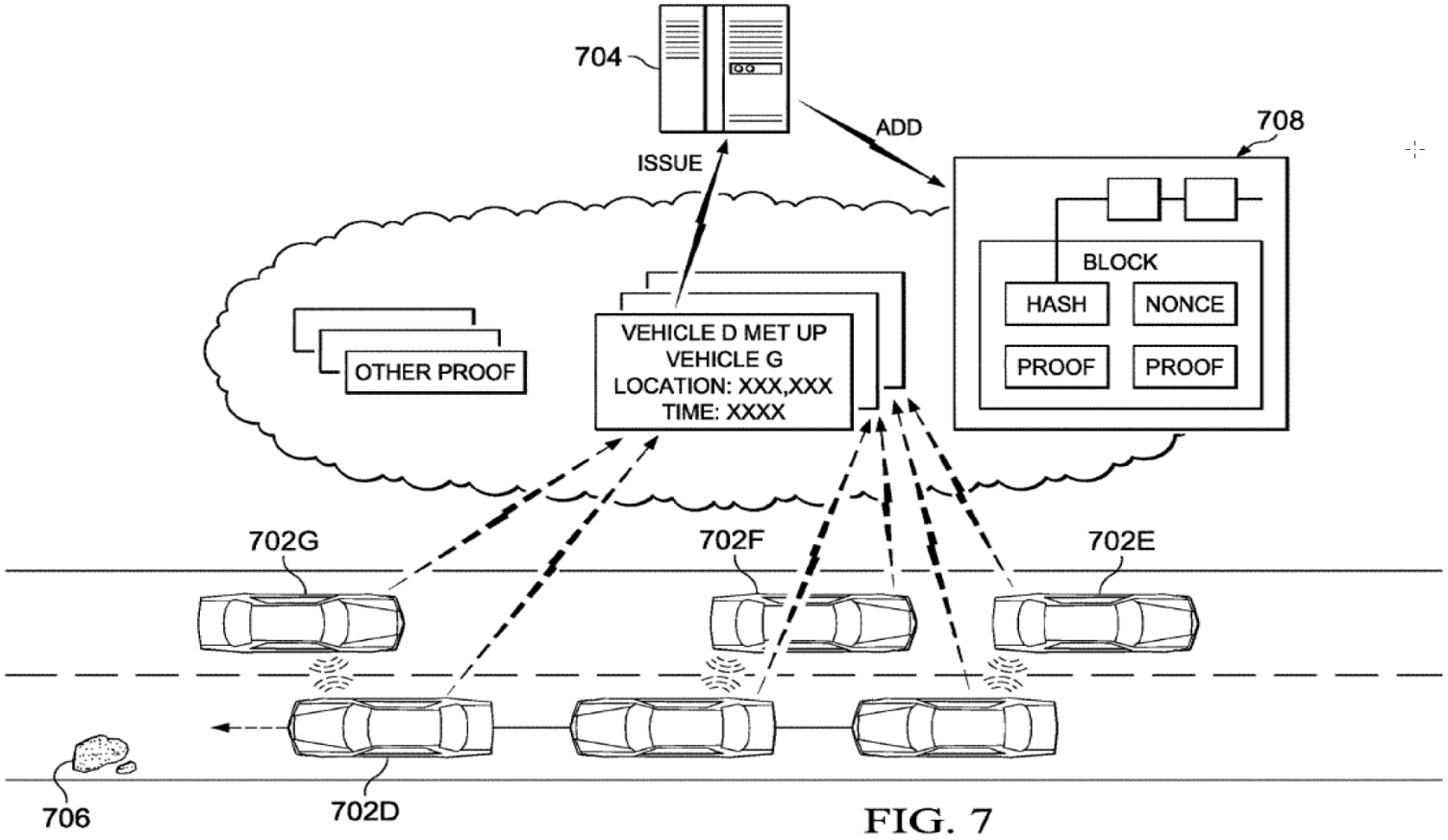


FIG. 7

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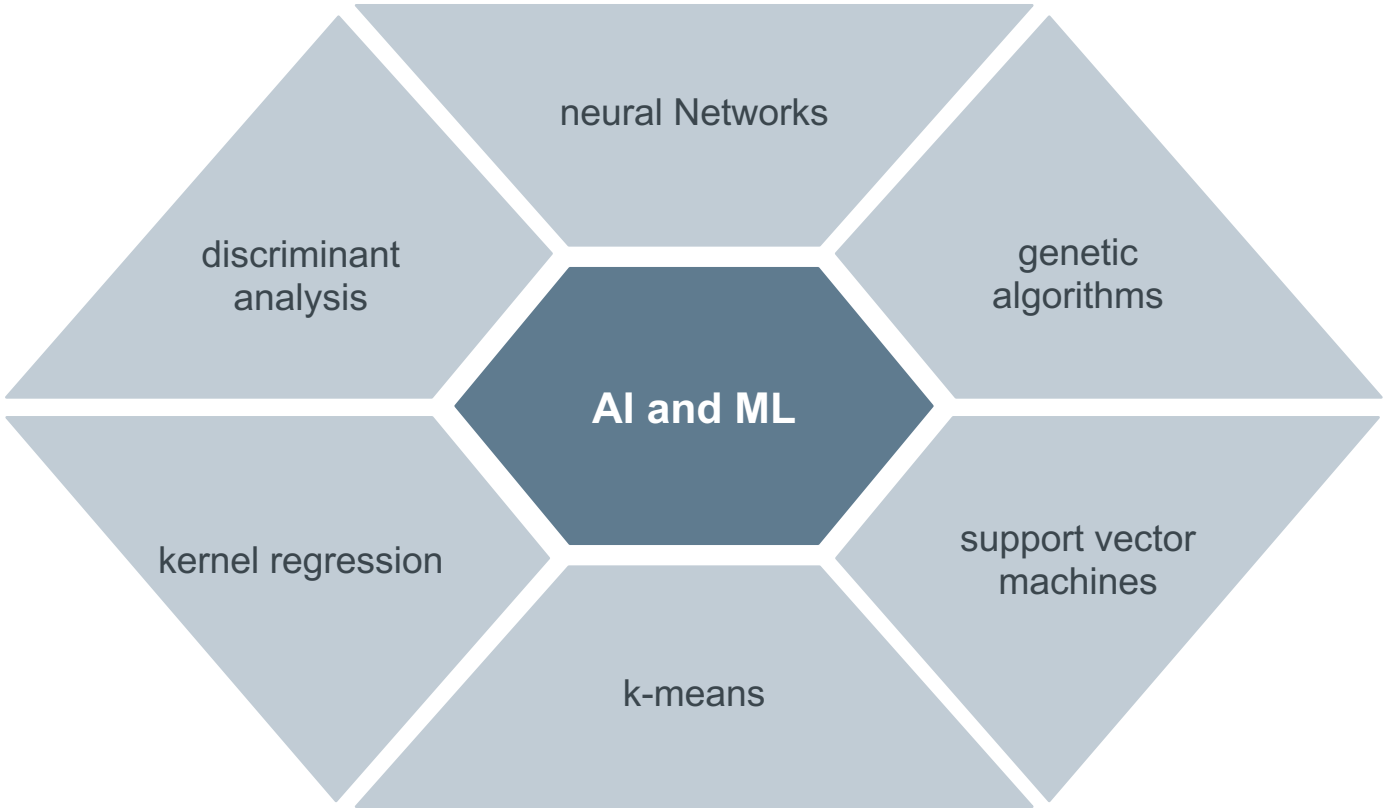
What is Artificial Intelligence – Machine Learning?



Are AI and ML Mathematical Methods ?

Mathematical method “per se”

Because based on

- computational models
- algorithms

With the purpose of

- classification
- clustering
- regression
- dimensionality reduction

Hence of abstract mathematical nature

Overcoming the first hurdle

Real world data:

- Data of technical nature
- Parameters of technical nature
- Trainable based on training data

Easy way out:

- Presence of Technical Means
- Guidelines for examination of CII: F-IV, 3.9

AI “mixed-type claims”: 2 consecutive legal requirements

1st legal requirement

Art. 52 (2) and (3) EPC

- The claimed subject-matter must have a technical character
- But claims may contain a mix of technical and non-technical features

2nd legal requirement

Art. 54, 56 EPC

- All features contributing to the technical character taken into account for assessment of inventive step
- ? Do(es) the mathematical method (steps) contribute to the technical character of the Invention ?
- Does a feature propose a non-obvious technical solution to a technical problem?

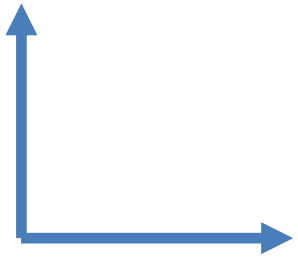
Patentability of AI and ML

Two dimensions to contribute to technical character

Do(es) the AI and ML method (steps) contribute to the technical character of the invention ?

Two dimensions:

1. By being adapted to a specific technical implementation (e.g. to specific HW)
2. By its application to a field of technology



Dimension 1: Specific technical implementation

Do(es) the AI and ML method (steps) contribute to the technical character of the invention ?

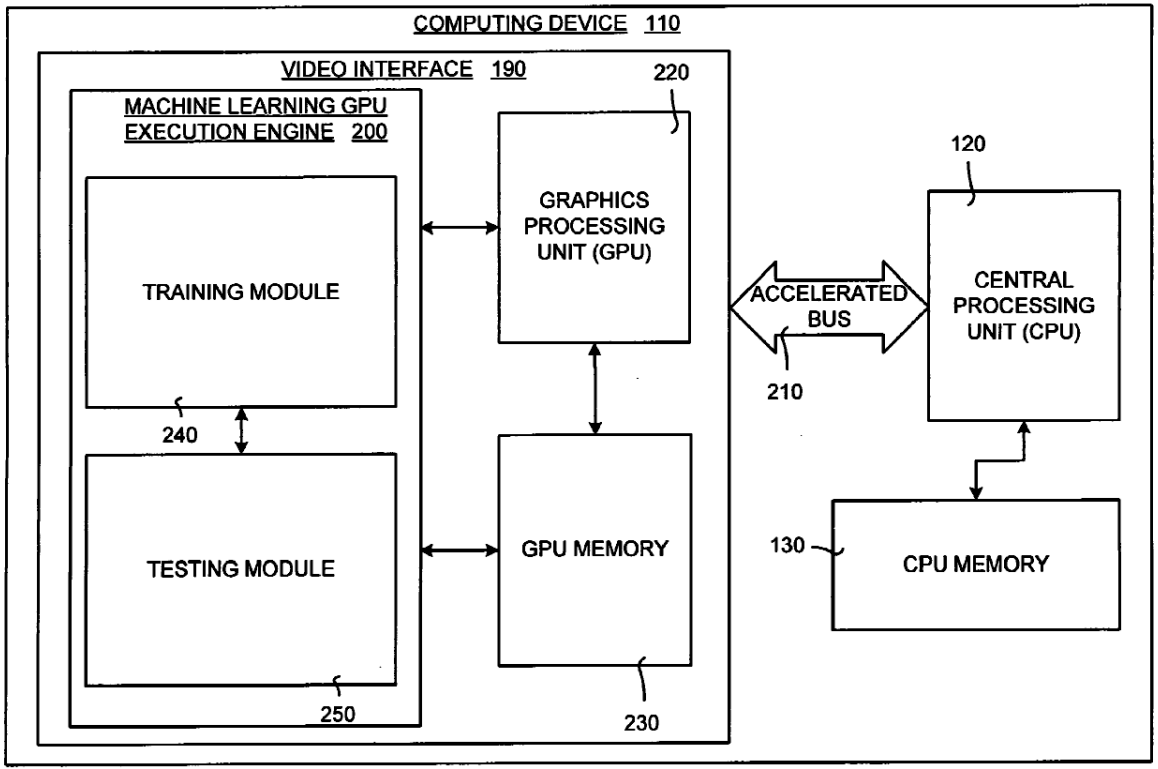
Usually eligible: claim directed to a specific technical implementation:

- AI algorithm is specifically adapted for that implementation;
- AI design motivated by technical considerations of the internal functioning of the computer;

Usually not eligible:

- generic technical implementation;
- mere programming;
- algorithm merely more efficient than in prior art.

Dimension 1: Specific technical implementation



Dimension 2: Application in a field of technology

Do(es) the AI and ML method (steps) contribute to the technical character of the invention ?

Yes, if, in the context of the invention, it serves a technical purpose:

- By technical application, i.e., to solve a specific technical problem in a technical field.
- The claims need to be functionally limited to their technical purpose.
- Typical application fields:
  - image & speech processing;
  - fault detection (prediction of maintenance needs);
  - medical analysis (...diagnosis);
  - ...self-driving cars...

Dimension 2: Technical application

Example:
Enhanced classifier for classification of digital images based on expanded training set

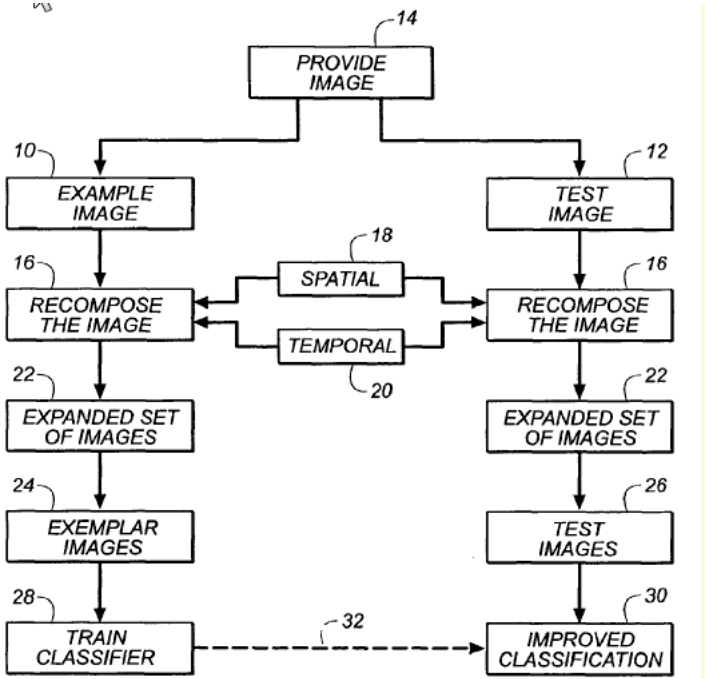


FIG. 9

AI specific terminology – clarity requirement

Terminology of the “field” of science

- Even accepted terminology not always clear in the field;
- Many buzzwords and marketing terms are used.

Legal requirement of clarity of a claim (Art. 84 EPC) is stricter

- Claims define the matter for which protection is sought;
- Claims must be clear and concise and supported by the description.

Terms are assessed as to technical character and to real meaning

- Support vector machine
- Neural network

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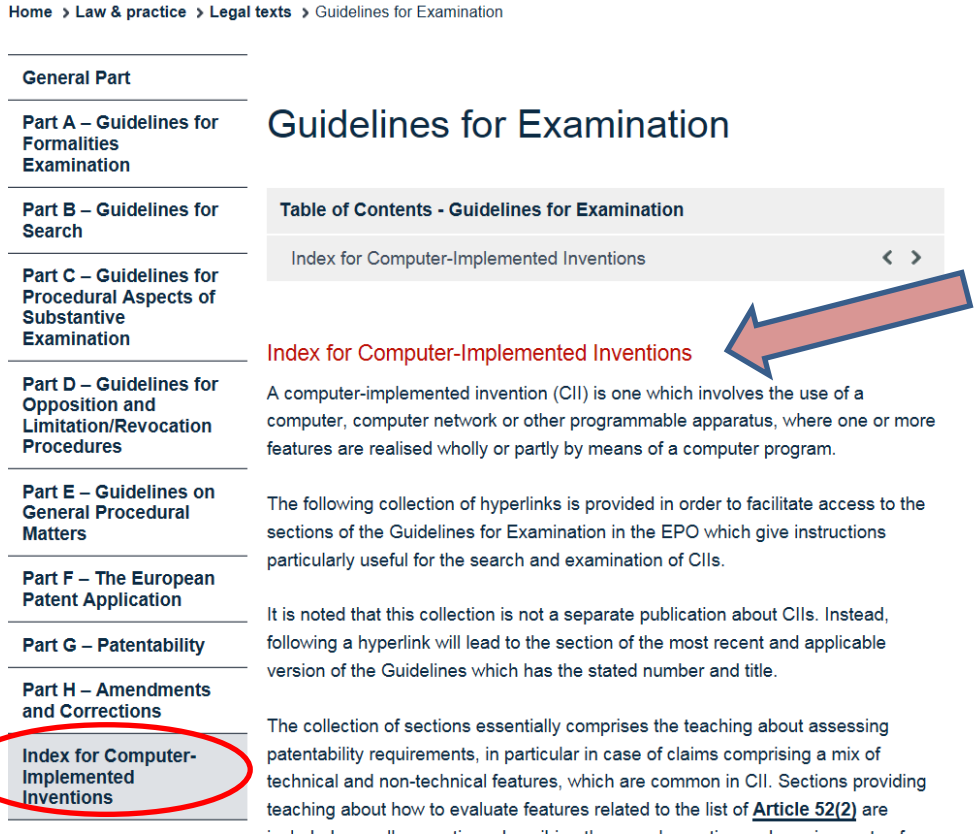
EPC Guidelines on CIIs



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Guidelines for Examination

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Index for Computer-Implemented Inventions

A computer-implemented invention (CII) is one which involves the use of a computer, computer network or other programmable apparatus, where one or more features are realised wholly or partly by means of a computer program.

The following collection of hyperlinks is provided in order to facilitate access to the sections of the Guidelines for Examination in the EPO which give instructions particularly useful for the search and examination of CIIs.

It is noted that this collection is not a separate publication about CIIs. Instead, following a hyperlink will lead to the section of the most recent and applicable version of the Guidelines which has the stated number and title.

The collection of sections essentially comprises the teaching about assessing patentability requirements, in particular in case of claims comprising a mix of technical and non-technical features, which are common in CII. Sections providing teaching about how to evaluate features related to the list of **Article 52(2)** are

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EPO’s CII practice: Worldwide benchmark

- **CIIs are a key area**
  - innovation
  - growing number of applications
  - many fields impacted

- **EPO sets worldwide benchmark in examining CIIs**
  - established practice from jurisprudence
  - predictability and legal certainty
  - harmonised approach across all technical fields

Thank you!

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